GRID CONNECTED WIND POWER PROJECT BY M/S. D. J. MALPANI IN RAJASTHAN

Document Prepared by EKI Energy Services Limited

Project Title	Grid Connected Wind Power Project by M/s. D. J. Malpani in Rajasthan
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity is grid-connected wind power generation in District- Jaisalmer, State- Rajasthan in India. M/s. D. J. Malpani is the owner and developer of the project activity. The total capacity of the project activity is 7.5 MW (5 WTGs × 1.50 MW). The project activity employs Wind Turbine Generators (WTGs) of Class S-82 manufactured by M/s. Suzlon Energy Limited.

The project activity supplies the generated electricity to Unified Indian Grid of India. The purpose of the project activity is generation of clean electricity by utilizing kinetic energy of wind. The project activity is estimated to generate 14,374 MWh of electricity annually; thus reducing GHGs to the tune of 13,433 tCO_2e/ annum for the entire crediting period of 10 years.

Pre-project Scenario:

The Project participant was not involved in generation of wind based power and supplying to grid at the same site under the pre-project scenario therefore, in the absence of the project activity, the equivalent amount of electricity would have been generated from the connected / new power plants in the Unified Indian Grid. The installed capacity is predominantly coal based and therefore is a major source of carbon dioxide emissions in India. The main emission source in the pre-project scenario is the power plants connected to the Unified Indian Grid and main GHG involved is CO_2.

The relevant implementation dates

The project plant has commissioned on 21-March-2011 and run satisfactorily since then.
The total estimated GHG emission reductions achieved in the second crediting period i.e. from 21-March-2021 to 20-March-2031 (first and last days included) is 134,330 tCO_2 e with annual average emission reduction of 13,433 tCO_2e.

The first crediting period was from 21-March-2011 to 20-March-2021(first and last days included) and the estimated annual emission reduction was 13,636 tCO_2e.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 1-Energy Industries (renewable- / non-renewable sources)
Project Type: Wind Energy Project

Project is not grouped project activity as per VCS guidelines

1.3 Project Eligibility

The project activity involves installation and generation of electricity using wind energy resources i.e. by using the renewable sources replacing electricity supply from a fossil-fuel dominated electricity, thus leads to reductions of anthropogenic GHG emissions from atmosphere. Hence the project activity is eligible Sectoral scope 1 i.e. energy industries (renewable/ non-renewable sources) under the scope of the VCS Program.

1.4 Project Design

The project involves setting up a wind farm of 7.5 MW ("Project) in the state of Rajasthan, India. Hence, the project has been designed to include a single installation of an activity and is not a grouped activity.

Eligibility Criteria

Not applicable to this project activity as this is not a grouped project.

1.5 Project Proponent

Organization name	M/s. D. J. Malpani
Contact person	Mr. Prafulla Khinvasara
Title	Head – Wind Power Project
Address	Malpani Estate, Kasara Dumala, Sangamner , Maharashtra -422 605 India
Telephone	0731 428 9086
Email	registry@enkingint.org

1.6 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Mr. Bibhushita Ghose
Title	Assistant Manager - Operations
Address	Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010,Madhya Pradesh, India
Telephone	0731 428 9086
Email	registry@enkingint.org

1.7 Ownership

As per VCS Program Definitions version 4, the project ownership is the legal right to control and operate the project activities.

M/s D. J. Malpani is the project proponent (PP) of project activity and they have the legal right to control and operate the project activities.

The project ownership has been demonstrated through below supporting document:

Power Purchase Agreement (PPA) – The Power Purchase Agreement (PPA) indicates that PP have the legal right to control and operate the project activities.

Based on above evidences, the project ownership is demonstrated and M/s D. J. Malpani is authorized project owner.

1.8 Project Start Date

The start date of the project activity is 21–March-2011 being the date of commissioning of the first wind turbine installed under the project activity (earliest date of commissioning for of the project activity WTGs AK-283 & AK-331)

1.9 Project Crediting Period

Project Crediting Period Start date: 21 March 2021

Project Crediting Period End date: 20 March 2031
Total Crediting Period: 10 Years
This is the second crediting period of this project activity. The first crediting period of this project activity was from 21-March-2011 to 20-March-2021.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Estimated average annual GHG emission reductions from the project activity for second crediting period are 13,433 tCO_2e per year, which is less than 300,000 tCO_2e per year. Hence the project scale of the project activity will become "Projects" as shown below:

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
2021-2022	13,433

2022-2023	13,433
2023-2024	13,433
2024-2025	13,433
2025-2026	13,433
2026-2027	13,433
2027-2028	13,433
2028-2029	13,433
2029-2030	13,433
2030-2031	13,433
Total estimated ERs	**134,330**
Total number of crediting years	**10**
Average annual ERs	**13,433**

1.11 Description of the Project Activity

Technology/Measure:

The wind power technology is considered as one of the most environmental friendly technologies available. The operation of the wind turbine does not emit any harmful GHGs or any other harmful gases like conventional power plants during their operation. The electricity generation is the result of the utilization of kinetic energy in wind to drive the wind turbine blades to generate electricity. Thus the operation of the wind power project is considered as environmentally safe.

Technical specifications for Class S-82[1]:

1.	Main Data	
	Turbine type	Horizontal axis turbine
	Rated Power	1500 kW
	Rotor Diameter	82 m
	Hub height (including foundation)	Approximately 78.5 m
	Rotational Speed	15.6 to 18.4 rpm

1 Suzlon S-82 Brochure - http://www.suzlon.com/products/12.aspx?l1=2&l2=8

2.	**Rotor**	
	Number of rotor blades	3
	Rotor Orientation	Upwind
	Material	Epoxy bonded fiber glass
3.	**Gear Box**	
	Type of Gear Box housing	One planetary stage / Two helical stages
	Ratio	1: 95.09
	Power	1650 kW
	Type of cooling	Forced oil cooling lubrication system
4.	**Generator System**	
	Generator type	Single speed induction generator with slip rings, variable rotor resistance via Suzlon Flexi slip system
	Rated power	1500 kW
	Speed at rated power	1511 rpm
	Rated voltage	690 V AC (phase to phase)
	Frequency	50 Hz
	Insulation Class	Class H
5.	**Tower**	
	Tower type	Tubular tower (corrosion proof painting on inner and outer surface) with welded steel plates
	Tower Height	76 m
6.	**Operational Parameters**	
	Cut-in wind speed	4 m/s
	Rated wind speed	14 m/s
	Cut-off wind speed	20 m/s
	Survival wind speed	52.5 m/s

The project technology is indigenous & no technology transfer is involved.

All WTGs involved in the project activity are developed and supplied by Suzlon Energy Limited, which is a well-known Indian supplier of wind turbines and so far has installed different capacities of WTGs in various countries. Suzlon Infrastructure Services Limited (SISL), a SUZLON Group Company, will provide all operations and maintenance services to the project activity.

The project activity uses wind energy in producing electricity and no other input is being used, therefore, it will not produce any GHG emission during its lifetime.

The commissioning details of WTGs of this project activity is shown below:

WTG ID	Date of Commissioning
AK-283, AK-331	21-March-2011
AK-278, AK-262, AK-321	30-March-2011

As the first WTG commissioning date of this project activity is 21-March-2011, this is considered as the start date of project activity.

1.12 Project Location

The project activity is located in District- Jaisalmer, State- Rajasthan in India. The details of project location are given below:

Sr. No.	Location No.	Khasra No.	Village	Taluka	Latitude	Longitude
1.	AK-278	83/P, 76/P	Sangana	Fatehgarh	N 26°47'48.7"	E 71°08'12.6"
2.	AK-283	147/P	Asayach	Jaisalmer	N 26°48'54.9"	E 71°07'04.6"
3.	AK-262	370/P	Chord	Fatehgarh	N 26°45'32.0"	E 71°09'49.3"
4.	AK-321	310/P	Chord	Fatehgarh	N 26°47'36.7"	E 71°10'15.8"
5.	AK-331	94/P	Asayach	Jaisalmer	N 26°49'45.3"	E 71°07'59.6"

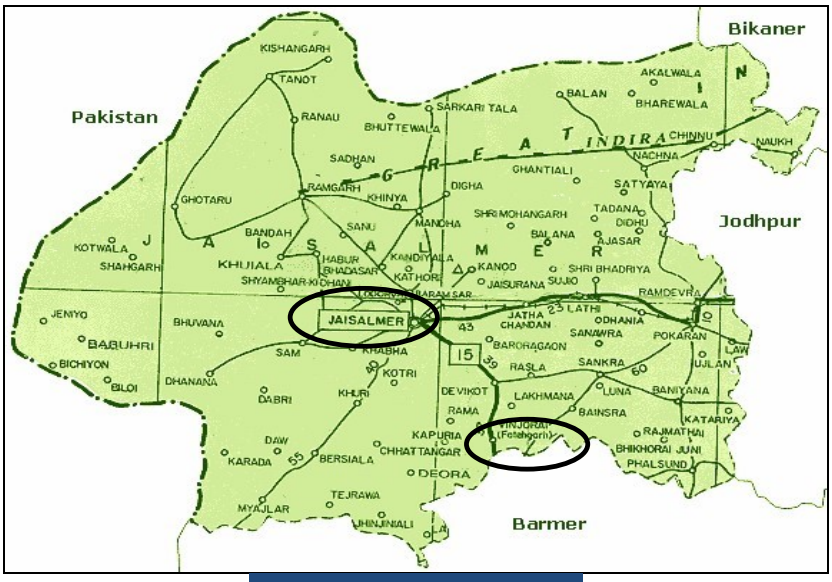


Figure: 01 Project activity on Map

1.13 Conditions Prior to Project Initiation

The project activity is a Greenfield activity that is the installation of WTGs for generating electricity. In the absence of the project activity taken up by the Project Proponent, the renewable energy source from the wind power would not have been generated. This would have resulted in equivalent power generation from the fossil fuel based Indian Grid Region Gird. Therefore the energy base line is the electrical energy displaced by the wind mill installed by the project proponent in the Indian Grid that would have continued without implementation of project activity.

The project activity harnesses wind energy to generate and supply electricity to the NEWNE grid, regional electricity grid of India. The employed WTGs can only convert wind energy into electrical energy and do not use any other fuel as input for electricity generation. The operation of WTGs is emission free and no GHG emissions are generated during the lifetime of the project activity.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received all the necessary approvals for development and commissioning for the project from the respective State Nodal Agencies and is in compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

Project has been registered with UNFCCC under Clean Development Mechanism program, Registration reference number is 5794.

The Web-link for the same has been mentioned below:

https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1329231564.5/view?cp=1

1.15.2 Projects Rejected by Other GHG Programs

The project activity has not been rejected by any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

India is Non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM with registration ID 5794. Project Proponent has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions.

1.16.2 Other Forms of Environmental Credit

Emission reduction generated from the project activity will not be double counted (i.e. issuance of other form of environmental credit/certificate) for a particular crediting period. PP has submitted an undertaking that they shall not claim GHG Emission Reduction credits from another type of credit.

1.17 Additional Information Relevant to the Project

Leakage Management

The project activity has use the new equipment's and there is not be any transfer of equipment, which can cause leakage. Hence, leakage management is not required.

Commercially Sensitive Information

There is no commercially sensitive information that has been excluded from the public version of project description.

Sustainable Development

Designated National Authority (DNA) of the host country (India) has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects in India6. The project proponent believes that the project activity has contributed to sustainable development in terms of the four indicators as follows:

Social well-being:

Social well-being focuses on the reflections of the project activity on the neighboring community. The project promoter envisages following social benefits:

- Improved standard of living
- Availability of infrastructure like electricity, roads, medical facilities etc.
- Reduce migration from rural to urban area for the sake of employment
- Awareness about the global issues, their solutions & role of India in the same
- Awareness among local people regarding wind power & its effect on rain and ground water level

It will thus be responsible in bringing social well-being in the region.

Environmental well-being:

The project activity is a clean source of power generation. The environmental aspects in consideration are as follows:

- In comparison to other sources of power generation prevailing in the country, wind power is the cleanest technology.
- As compared to other power plants, less amount of land is required for a single wind turbo generator.
- Wind power is renewable. It can be used continuously, whenever available. There is no danger of depletion of the raw material used for power generation.
- Wind power is a naturally available source of energy. There is no processing required to make it available for power generation.
- It does not result in biodiversity loss which occasionally occurs in some other power plants like hydro.

Thus, wind power technology goes hand-in-hand with the environmental well-being of the region.

Technological well-being:

The power generation technology used in this project activity is provided by M/s. Suzlon Energy Limited. The technological well-being envisaged by the project promoter is as follows:

- It boosts the use of such technology by other project developers.
- Successful implementation and operation of this project gives necessary impetus in implementation of similar technology in the region.
- The project activity leads to transfer of environmentally safe and sound technologies that are comparable to best practices in order to assist in upgradation of the technological base in the local region.

Economic well-being:

Economic well-being refers to additional investment consistent with the needs of the local community. The project in due course of time drew additional investment to the region. In general, the project activity envisages following economic benefits:

- Employment opportunities

- Market facilities for local products
- Industrial development
- Increase in real income
- Increase in regional gross domestic product
- Capital formation
- Improvement of a rural economy
- Flow of goods and services

Although the realization of the above benefits would take a longer time needlessly, the economic development of the region has been attributed to the project operation. The project contributes to the sustainable development of the region during its entire operational life.

Further Information

There is no additional relevant legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

According to Indian regulation, the implementation of the wind park does not require an environmental impact assessment. The Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India notification dated 14-September-2006 regarding the requirement of Environment Impact Assessment (EIA) studies as per the Environment Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) MINISTRY OF ENVIRONMENT AND FORESTS) states that any project developer in India needs to file an application to the Ministry of Environment, Forest and Climate Change (including a public hearing and an EIA) in case the industry or project is listed in a predefined list. Wind parks are not included in this list and thus an EIA is not required.

2.2 Local Stakeholder Consultation

The stake holder meeting was conducted at Suzlon's Regional office at Jaisalmer (Rajasthan) on 24-March-2011 at 11.30 a.m. The stake holders were invited by Public Notice dated 12-March-2011, personal invitations were also given to the stake holders. The meeting was coordinated by Suzlon Energy Limited. Mr. Mohammad Abid & Mr. Himanshu Kulkarni represented Suzlon in the meeting. The PP was represented by Mr. Nitin Jadhav. The stake holders were identified based on the sustainability impact (direct & indirect) of this project activity on the life of the local people.

The project proponent & Suzlon welcomed the stakeholders for the meeting. The meeting was conducted in Hindi. Mr. Mohammad Abid explained the purpose of the meeting to the present stakeholders and introduced all the stakeholders to all the representatives. He briefed the stakeholders about the concept of Clean Development Mechanism, wind technology, climate change, effect of greenhouse gases on human life, environmental benefits of the wind power projects etc.

During the meeting, Mr. Mohammad Abid explained about the power-deficit scenario in India and the need of energy. He explained importance of wind mills projects with respect to environmental well-being and its effect on local economy. He informed stakeholders about project promoter's keen interest in development of this proposed project and its effect on sustainable development of the local area.

Some villagers gave comments (which are discussed below) on the wind farm and its effect on their life. The stakeholder meeting ended with vote of thanks by Suzlon and PPs.

Summary of comments received

During the meeting the project proponent & Suzlon invited the stakeholders to offer their comments on the project.

The stake holders present in the meeting gave a positive response; illustrating the different improvements made in the village due to the project activity like medical facilities, availability of ambulance, oxygen cylinders, civil work contracts to the local people etc. They further added that, different employment opportunities, like security guards, drivers, have been created for local people.

Baburam, one of the villagers, said that due to wind mill projects he has got employment at the wind farm, which has helped him to live much better life.

Jitendra, a local driver, said he is happy with the wind farm development in the local area as he has got job as a driver and that helped him to live a stable life.

Report on consideration of comments received

No negative comments were received on the project activity, so no additional measures are required by the PP.

The process of Local Stakeholder Consultation is continuous. Registers is used to records the grievances and feedback. During the current monitoring period, No grievances received during the current monitoring period, therefore, no any mitigation measures are required. In case of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site incharge. The grievance copies have been submitted to DOE.

2.3 Environmental Impact

The guidelines on Environmental Impact Assessment have been published by Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India (GOI) under Environmental Impact.

Assessment notification 14-September-2006[2]. Further amendments to the notification have been done on 01-December-2009[3]. As per the notification:

"The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall hereinafter referred to be as the Central Government in the Ministry of Environment and Forests for matters falling under Category 'A' in the Schedule and at State level the State Environment Impact Assessment Authority (SEIAA) for matters falling under Category 'B' in the said Schedule, before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity:

2 EIA Notification 2006, http://envfor.nic.in/legis/eia/so1533.pdf

3 EIA Amended Notification dated 01/12/2009, http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

(i) All new projects or activities listed in the Schedule to this notification;

(ii) Expansion and modernization of existing projects or activities listed in the Schedule to this notification with addition of capacity beyond the limits specified for the concerned sector, that is, projects or activities which cross the threshold limits given in the Schedule, after expansion or modernization;

(iii) Any change in product - mix in an existing manufacturing unit included in Schedule beyond the specified range."

As the wind power generation projects are not listed in any of the categories of the schedule, it does not require Environmental Impact Assessment.

2.4 Public Comments

The Global Stakeholder Consultation commenting period had been completed before first crediting period. No comments had been received in the commenting period.

2.5 AFOLU-Specific Safeguards

The project activity deals with generation of electricity using wind and not from AFOLU projects. Hence not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title: "Grid Connected Renewable Electricity Generation" Version 18.0[4]

Reference: AMS I. D.: Small-scale Consolidated Methodology

The methodology AMS I.D. refers to the latest approved versions of the following tools:

Tool to calculate the emission factor for an electricity system, Version 07.0 (EB 100, Annex 04)[5]
Tool for the demonstration and assessment of additionality, Version 7.0[6]

3.2 Applicability of Methodology

The applicability conditions of the methodology on the project activity are demonstrated as follows:

Applicability Criterion	Project Case
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: a) Supplying electricity to a national or a regional grid.	The project activity is a Renewable Energy Project i.e. Wind Power Project which falls under applicability criteria option 1(a) i.e., "Supplying electricity to a national or a regional grid". Hence the project activity meets the given applicability criterion.

[4] https://cdm.unfccc.int/UserManagement/FileStorage/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC
[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf
[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

<table>
<tr><th>Applicability Criterion</th><th>Project Case</th></tr>
<tr><td>b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.</td><td></td></tr>
<tr><td>2. Illustration of respective situations under which each of the methodology (i.e. “AMS-I.D.: Grid connected renewable electricity generation”, “AMS-I.F.: Renewable electricity generation for captive use and mini-grid” and “AMS-I.A.: Electricity generation by the user) applies is included below
<table>
<tr><th></th><th>Project Type</th><th>AMS-I.A</th><th>AMS-I.D</th><th>AMS-I.C</th></tr>
<tr><td>1</td><td>Project supplies electricity to a national/regional Grid</td><td></td><td>√</td><td></td></tr>
<tr><td>2</td><td>Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)</td><td></td><td></td><td>√</td></tr>
<tr><td>3</td><td>Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)</td><td></td><td>√</td><td></td></tr>
<tr><td>4</td><td>Project supplies electricity to a mini grid1 System where in the baseline all generators use exclusively fuel oil and/or diesel fuel</td><td></td><td></td><td>√</td></tr>
<tr><td>5</td><td>Project supplies electricity to household users (included in the project boundary) located in off grid areas</td><td>√</td><td></td><td></td></tr>
</table></td><td>The 1st option of Table 1 “Scope of AMS-I.D., AMS-I.F. and AMS-I.A. based on project types” of AMS I.D. Version 18, EB 81 is applicable.</td></tr>
<tr><td>3. This methodology is applicable to project activities that:
a. Install a Greenfield plant;
b. Involve a capacity addition in (an) existing plant(s);
c. Involve a retrofit of (an) existing plant(s);
b) Involve a rehabilitation of (an) existing plant(s)/unit(s); or
c) Involve a replacement of (an) existing plant(s).</td><td>The project is installation of new wind based electricity generation plants (not addition to existing system). Option (a) is applicable.</td></tr>
<tr><td>4. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:
a. The project activity is implemented in an existing reservoir with no change in the volume of reservoir;</td><td>The project is wind power project and thus the criterion is not applicable to this project activity.</td></tr>
</table>

Applicability Criterion	Project Case
b. The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m^2 ; c. The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.	
5. If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity is a 7.5 MW wind electricity generation. Unit does not co-fire fossil fuels. Hence the criterion is not applicable to the project activity.
6. Combined heat and power (co-generation) systems are not eligible under this category	The Project activity is a renewable wind energy project and is not a combined heat and power system. Hence the criteria is not applicable to the project activity
7. In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct1 from the existing units.	The project activity is Greenfield and there is no existing power generation facility at the site. Hence the criteria is not applicable to the project activity
8. In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	Not applicable, the wind project is a Green field project activity and this project is not the enhancement or up gradation project.
9. In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored.	The Project activity is a renewable wind power project and is not a landfill gas, waste gas, wastewater treatment and agro-industries projects or recovered methane emissions project. Hence the criteria is not applicable to the project activity
10. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply	The Project activity is a renewable wind power project and is not a biomass project. Hence the criteria is not applicable to the project activity.
Applicability conditions of "Tool to calculate the emission factor for an electricity system"	
1. This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would	This condition is applicable. OM, BM and CM are estimated using the tool under section 4.1 for calculating baseline emissions.

Applicability Criterion	Project Case
have been provided by the grid (e.g. demand-side energy efficiency projects).	
2. Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off grid power plants. In the latter case, the conditions specified in "Appendix 2: Procedures related to off grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Since the project activity is grid connected, this condition is applicable and the emission factor has been calculated accordingly.
3. In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project activity is located in India, a non-Annex I country. Therefore, this criterion is not applicable for the project activity.
4. Under this tool, the value applied to the CO2 emission factor of biofuels is zero.	The project activity is a grid connected wind power project and not a hydro power plant. Therefore, this criterion is not applicable for the project activity.

In this project, total electricity generation capacity of all six windmills is 7.5 MW, which is less than the limit of 15 MW of maximum output capacity as specified in Annex-II "Simplified Modalities & Procedures for Small Scale CDM Project Activities" for Type (I) project activities: renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts (or an appropriate equivalent) (decision 17/CP.7, paragraph 6 (c) (i). Thus, this project reduces anthropogenic emissions by sources and its maximum output capacity is less than 15 MW. Therefore it confirms to this category thereby qualifying as a small-scale project activity.

3.3 Project Boundary

Project boundary has ascertained using para 18 of AMS I.D (Version 18.0, EB 81) -, 'The physical, geographical site of the renewable generation source delineates the project boundary.'

The project activity is located in the State of Rajasthan and is supplying generated electricity to the Unified Indian Grid of India. The project boundary consists of project activity, evacuation facility, common metering point and connectivity to the Indian Grid. The schematic diagram of project boundary is as follows:

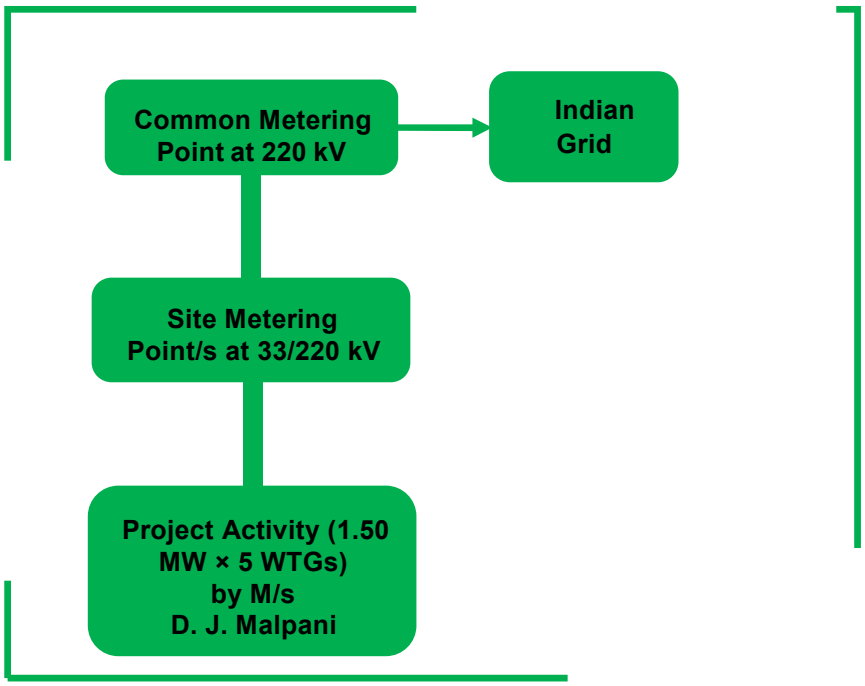


Figure 02: Project Boundary (Indicative)

Baseline and project emission sources:

Source		Gas	Included?	Justification/Explanation
Baseline	Combustion emissions from generating grid connected electricity.	CO_2	Included	Main emission source.
		CH_4	Excluded	Minor emission source.
		N_2O	Excluded	Minor emission source.
		Other	Excluded	Minor emission source.
Project	Emissions from the project activity	CO_2	Excluded	Wind energy generation does not have any GHG emissions
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	

No leakage is applicable to the project activity as per applied methodology.

3.4 Baseline Scenario

Baseline scenario for the second crediting period in line with the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1[7].

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources into the grid. Thus this project activity was a voluntary investment which intends to replace equivalent amount of electricity at grid from renewable source. PP was not bound to incur this investment; hence absence of project activity (i.e. the investment) does not lead to any continued baseline practice for PP within their scope whereas the continued operation of the project activity would continue to replace equivalent amount of electricity at grid. Hence, the same baseline as identified in the previous crediting period is still valid for the project. Therefore, the assessment of the changes in market characteristics is not required for the renewal of the project's crediting period under VCS.

Nevertheless, there is an impressive growth attained by the Indian Power Sector within the recent years, the installed capacity has grown from mere 1,713 MW in 1950 to 370,047. MW as on 31.03.2020, consisting of 230,809.57 MW Thermal, 86,759.19 MW Renew and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 1[8] that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO_2 emissions in the country by increased use of renewable energy sources.

Furthermore, project participant has considered the latest available CO_2 Baseline Database (CEA database, version 16) at the time of requesting renewal of the crediting period for establishing the baseline emission factor, which itself considered all the new circumstances. Hence, the new circumstances do not have an impact on the baseline emission. As per below table, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original.

Table 1: Sector- wise installed capacity (MW) as on 31-March-2020 (CEA Database version 16)

[7] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

[8] https://cea.nic.in/wp-content/uploads/baseline/2021/06/User_Guide_ver_16_2021-1.pdf

Sector	Thermal					Nuclear	Hydro	RES	Total
	Coal	Lignite	Gas	Diesel	Total				
State	65571.50	1290.00	7118.71	236.01	74216.21	0.00	26958.50	2357.03	103531.74
Central	58990.00	3490.00	7237.91	0.00	69717.91	6780.00	15346.72	1632.30	93476.93
Private	74173.00	1830.00	10598.74	273.70	86875.45	0.00	3394.00	82769.86	173039.30
All India	198734.50	6610.00	24955.36	509.71	230809.57	6780.00	45699.22	86759.19	370047.97

Thus, current baseline remain same and there is no impact if circumstances, existing at the time of requesting renewal of crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

As explained in step 1.2, the baseline scenario was the electricity import/generation from the power plants connected to the electricity grid. The project activity in green field project and there is no any baseline equipment or investment involved in project activity. Therefore this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that "Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the VCS project activity."

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database available at the time of PD submission for renewal.

In line with the project standard version 02.0, the impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant EB guidance with regard to renewal of the crediting period at the time of requesting renewal of crediting period; and the correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the existing laws. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the Enactment of the act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003 was in force at the time of the completion of the baseline study for the registered PDD.

Section 3 of the said act required the Central Government to prepare the national electricity policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. In accordance with the section 3 of the Electricity Act 2003, the Central Government notified the National Electricity Policy[9] on 12-February-2005 which was in force at the time of completion of the baseline study as stated in the registered PD of the project activity. This policy has not been revised since then and is currently in force as well.

In addition to the above policies, State Electricity Regulatory Commissions (SERCs) have announced preferential tariffs and Indian Renewable Energy Development Agency (IREDA) provides term loan assistance towards establishing biomass power projects. All these fiscal and financial incentives were in force at the time of completion of the baseline study for the registered PDD of the project activity and still continue to exist.

The state electricity regulatory commission issues tariff order in respect of procurement of power generated from renewables and there is no mandatory national and/or sectoral policies have come into effect that would affect the compliance of the current baseline. Hence, it can be concluded the current baseline complies with all relevant mandatory national and/or sectoral policies that have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period.

However, in spite of the financial incentives given by the government to renewable power projects in India the generation from the low cost must run resources connected to the Indian Grid has not increased to such an extent that this would lead to more than 50% contribution from the low cost must run resources towards the total generation from the Indian Grid.

The approved small scale methodology for Grid connected renewable electricity generation, AMS-I.D (Version 18), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "Tool to calculate the emission factor for an electricity system" (version 07.0) has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

As per CEA database version 16, the fossil fuel dominated electricity is more than renewable sector and is continuing with same pattern. In light of the above discussion it is to be concluded that in accordance with relevant guidelines stipulated in the Project Standard version 02.0, national and/or sectoral policies and circumstances had been considered towards formulating the OM & BM baseline scenario. Hence the baseline scenario as applied for the present project activity remains justified.

As per the approved small scale methodology for Grid connected renewable electricity generation, AMS-I.D (Version 18.0) para 19: "If the project activity is the installation of a Greenfield power plant, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The project activity involves setting up of wind project to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants.

In the absence of the project activity, the equivalent amount of power would have been drawn from the Indian grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

[9] http://www.cercind.gov.in/Act-with-amendment.pdf

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 16 is the latest available data at the time of PD submission to DOE for validation, hence same is considered for emission factor calculations.

The combined margin of the Indian grid used for the project activity is as follows

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9346 tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline CO_2 Emission Database, Version 16.0, Mar 2021 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9568 tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y	Calculated as the last 3 year (2017-18, 2018-19, 2019-20) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 16.0, Mar 2021 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8682 tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 16.0, Mar 2021 published by Central Electricity Authority (CEA), Government of India

3.5 Additionality

Regulatory Surplus Demonstration:

In India, there is no any regulation to install the wind projects and the project activity is a voluntary step taken by PP. In India, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original. As discussed in section 3.4 of VCS PD, there is no any Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity and project activity is additional as per CDM Tool for the demonstration and assessment of additionality and as per VCS Program rules.

There are no certain laws and regulations which give comparative advantage to more emission intensive technologies or less emission intensive technologies. There are no any Type E+ and E- policies applicable to the project activity which prevent the implementation of local laws and regulations that would seek to contribute towards climate change mitigation. The project activity is in compliance with local laws and regulations. As explained in section 3.4, the current baseline complies with all relevant mandatory national and/or sectoral policies.

Project Additionality:

The additionality of this wind power project is proven by using the Investment barrier (option a) in accordance with Attachment A of Appendix B (Version 08, EB- 63, Annex- 24) & Guidelines on the Assessment of Investment Analysis (Version- 5, EB- 62, Annex- 5)

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

The investment analysis for this project activity is done as per the "Guidelines on the Assessment of Investment Analysis" (Version- 5, EB- 62, and Annex- 5).

Project proponent is required to determine that the project activity is not:

- The most economically or financially attractive; or
- Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

As per paragraph 19 of "Guidelines on the Assessment of Investment Analysis" (Version- 5, EB- 62, Annex- 5) – If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate. Hence, project promoter has considered Benchmark analysis to prove the additionality of the project.

PP has considered post tax project IRR as suitable financial indicator for the project.

Suitability of BENCHMARK:

The 'Guidelines on the Assessment of Investment Analysis' (Paragraph- 12, Version- 5, EB- 62, Annex- 5) states that, Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR, hence PP has selected Prime Lending Rate (PLR) applicable at the time of project conceptualization stage. PP has considered PLR of Bank of Baroda[10] as bench mark of the project. The PLR of the bank at the time of project conceptualization was 13.25%, which has been considered as benchmark of the project.

Calculation and comparison of financial indicators

PP has calculated project IRR of the project for entire life cycle. Key financial assumptions are as under:

Sr. No.	Particulars	Unit	Value	Reference
1.	Capacity	kW	1500	Proposal from Supplier
2.	Machines	No.	05	Proposal from Supplier
3.	Total Capacity	kW	7500	Proposal from Supplier
4.	Net annual generation from project	Million kWh	15.14	PLF Assessment Report
5.	PLF[11]	%	23.04	PLF Assessment Report

10 Bank of Baroda is a regular lender to the PP.

11 The PLF value arrived by the 3 party PLF report is 23.04% whereas the PLF offered by Suzlon is. 21.88%. So, PP has considered PLF value of 23.04% for IRR working & PLF of 21.88% for baseline calculations as a conservative approach.

6.	Deration in 6th, 10th, 14th and 18th year	%	1.25	Rajasthan Electricity Regulatory Commission order September 2006
7.	Tariff Rate	INR/kWh	3.87	Rajasthan Electricity Regulatory Commission Tariff order 06-August-2010
8.	O & M Cost per WTG	INR in Million	1.70	Proposal from Supplier
9.	O & M	INR in Million	8.50	Proposal from Supplier
10.	Service Tax (at 10.30%)	INR in Million	0.88	Service Tax Rule
11.	O & M including Service tax	INR in Million	9.38	Calculated
12.	Escalation in O & M Exp.	%	5.00	Proposal from Supplier
13.	O & M Free For	years	1st Year	Proposal from Supplier
14.	Insurance	INR in Million	0.66	Sheet no. 31 under Risk code 70 , Rate code 05 of http://iib.gov.in/IRDA/tac/tariffs/AIFT2001.pdf
15.	Cost of WTG	INR in Million	442.03	Proposal from Supplier
16.	Promoters contribution	INR in Million	442.03	Promoter Decision
17.	Depreciation as per Companies Act	%	4.50	Rajasthan Electricity Regulatory Commission order September 2006
18.	Income Tax	%	30.90	Section 143, Income Tax Act 1961

The Project IRR value for the project activity has been calculated for the life time of the project. The post-tax Project IRR without CDM benefits comes to 8.91%, which is lower than the benchmark rate of 13.25[12]%.

Thus, we can conclude that successful VCS registration of this project activity is important to make it financially attractive.

Sensitivity analysis

The "Guidelines on the Assessment of Investment Analysis" (Paragraph 20, Version- 5, EB- 62, Annex- 5), states that only variables, including the initial investment cost, that constitute more than 20 % of either total project costs or total project revenues should be subjected to reasonable variation.

The different parameters that affect the viability of a wind power project as per above clause are mentioned below –

Parameters	Comments
Annual Generation	This is the most important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.

12 http://www.moneycontrol.com/stocks/stock_market/corp_notices.php?autono=391989

Project Cost	This is other important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.
O & M Cost	This does not add to 20% of either total project cost or total project revenues, even then sensitivity analysis is conducted out to show the effect on viability of the project.
Tariff	This is the most important and critical parameter for any Power Project & hence viability of the project will be affected by any fluctuation in this parameter. Sensitivity analysis has therefore been carried out for it.

Outcome of Sensitivity analysis:

Sensitivity Analysis based on Annual Generation, Project Cost and O & M Cost			
Variation by....	-10%	0	10%
Annual Generation	6.90%	8.91%	10.79%
Project Cost.	10.59%	8.91%	7.48%
O & M Cost	9.30%	8.91%	8.50%
Tariff	6.90%	8.91%	10.79%

From the above table it seems that if the generation increased by 10%, project cost decreased by 10%, O & M decreased by 10% and tariff increased by 10%, the financial indicator will not cross the benchmark selected by the PP. The project activity is clearly unattractive in absence of CDM income. Hence the project activity is additional.

The successful registration of the project as VCS project is imperative in order to make it financially more attractive.

3.6 Methodology Deviations

There is no request for methodology deviation applied during current monitoring period.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline Emissions (BE_y):

As per the approved consolidated Methodology AMS I.D. (Version 18.0) para 22:

Baseline emissions include only CO_2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$

Where:

BE_y	=	Baseline emissions in year y (tCO_2)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

As per methodology, combined grid emission factor as per the "Tool to calculate the emission factor for an electricity system" version 07 is calculated as below.

CO_2 Baseline Database for the Indian Power Sector, Version 16, March 2021 published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

As per Methodological tool: Tool to calculate the emission factor for an electricity system (Version 07.0, EB 100, Annex 4), following six steps have been followed:

(a)	Step 1:	Identify the relevant electricity systems;
(b)	Step 2:	Choose whether to include off-grid power plants in the project electricity system (optional);
(c)	Step 3:	Select a method to determine the operating margin (OM);
(d)	Step 4:	Calculate the operating margin emission factor according to the selected method;
(e)	Step 5:	Calculate the build margin (BM) emission factor;
(f)	Step 6:	Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

As described in tool "For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO^2 Baseline Database. As of 31 December 2013, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified INDIAN Grid. Since the project supplies electricity to the Indian grid,

emissions generated due to the electricity generated by the INDIAN grid as per CM calculations is serving as the baseline for this project.

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar& Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Puducherry
Rajasthan		Goa	Tripura	Lakshadweep
Uttar Pradesh				
Uttarakhand				

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The Project Participant has chosen only grid power plants in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

(a) Simple OM; or

(b) Simple adjusted OM; or

(c) Dispatch data analysis OM; or

(d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
India	16.8%	15.1%	14.6%	14.3%	14.5%	17.0%

Data Source: Central Electricity Authority (CEA) database Version 16, Mar'2021[13]

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of the total generation. Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

(a) **Ex-ante option:** if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

(b) **Ex-post option:** if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the DOE for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor ($EF_{grid,OMSimple,y}$) according to the selected method

The operating margin emission factor has been calculated using a 3 year data vintage:

[13] https://cea.nic.in/wp-content/uploads/baseline/2021/06/User_Guide_ver_16_2021-1.pdf

Net Generation in Operating Margin (GWh) (incl. Imports)			
	2017-18	2018-19	2019-20
INDIAN Grid	960,693	995,957	965,009

Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
	2017-18	2018-19	2019-20
INDIAN Grid	0.9543	0.9603	0.9555

Weighted Generation Operating Margin	
INDIAN Grid	0.9568

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, and Annex 4) para 72:

In terms of vintage of data, project participants can choose between one of the following two options:

(a) **Option 1** - for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

(b) **Option 2** - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 as described above is chosen by PP to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
	2019-20
INDIAN Grid	0.8682

Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid,CM,INDIAN,y}$)

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 81:

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,INDIA,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

PP has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (t CO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (t CO_2/MWh)

W_{OM} = Weighting of operating margin emissions factor (per cent)

W_{BM} = Weighting of build margin emissions factor (per cent)

The following default values should be used for W_{OM} and W_{BM}:

Wind and solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods. Since project activity is of Wind power generation, the above weightage has been considered for OM and BM.

Therefore, $EF_{,grid,CM,y}$ = 0.9568 * 0.75 + 0.8682 * 0.25

= 0.9346 tCO_2/MWh

Baseline emission factor (EF_y):

The baseline emission factor is calculated using the combined margin approach as described in Step 6 above:

Therefore, $EF_y = EF_{grid,CM,y}$ =0.9346 tCO_2/MW

Now $EG_{PJ,y} = EG_{PJ,facility,y}$ as the project activity is the installation of a greenfield power plant.

Baseline Emissions

BE_y = $EG_{PJ,facility,y}$ x $EF_{grid,CM,y}$

= 14,374MWh * 0.9346 tCO_2e/MWh

= 13,433 tCO2e/year

4.2 Project Emissions

The project activity is based on renewable wind energy, therefore, project emissions should not be considered as per methodology, $PE_y = 0$

4.3 Leakage

No other leakage emissions are considered. $LE_y = 0$

4.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2021-2022	13,433	0	0	13,433
2022-2023	13,433	0	0	13,433
2023-2024	13,433	0	0	13,433
2024-2025	13,433	0	0	13,433
2025-2026	13,433	0	0	13,433
2026-2027	13,433	0	0	13,433
2027-2028	13,433	0	0	13,433
2028-2029	13,433	0	0	13,433
2029-2030	13,433	0	0	13,433
2030-2031	13,433	0	0	13,433
Total	**134,330**	**0**	**0**	**134,330**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2 /MWh
Description	Operating margin CO_2 emission factor for Unified Indian Grid in the year y
Source of data	CO_2 Baseline Database for the Indian Power Sector, User Guide (Version 16)
Value applied:	0.9568
Justification of choice of data or description of measurement methods and procedures applied	The Central Electricity Authority of India prepares the data
Purpose of Data	For the calculation of grid emission factor for estimating the baseline emissions
Comments	This database is an official publication of Government of India for the purpose of CDM baseline. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done *ex ante* its value will remain fixed for the entire crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2 /MWh
Description	Build margin CO_2 emission factor for Unified Indian Grid in the year y
Source of data	CO_2 Baseline Database for the Indian Power Sector, User Guide (Version 16[14])
Value applied	0.8682
Justification of choice of data or description of measurement methods and procedures applied	The Central Electricity Authority of India prepares the data.
Purpose of Data	For the calculation of grid emission factor
Comments	This database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the Central Electricity Authority and hence considered

[14] https://cea.nic.in/wp-content/uploads/baseline/2021/06/User_Guide_ver_16_2021-1.pdf

	authentic. As the calculation of baseline emission has been done *ex ante* its value will remain fixed for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2 /MWh
Description	Combined margin CO_2 emission factor for Unified Indian Grid in the year y
Source of data	Grid emission factor calculation: $EF_{grid,CM,y}$ = 0.75 x $EF_{grid,OM,y}$ + 0.25 x $EF_{grid,BM,y}$ = 0.75 x 0.9568+ 0.25 x 0.8682 = 0.9346 tCO_2/MWh Values of OM and BM are taken from CEA User Guide, CO_2 Baseline Database for the Indian Power Sector, Version 16.
Value applied	0.9346
Justification of choice of data or description of measurement methods and procedures applied	The $EF_{grid,CM,y}$ calculation is based on the guidelines in emission tool.
Purpose of Data	For the calculation of emission reductions from the project activity.
Comments	The calculation is done ex ante.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,facility,y}$
Data unit	MWh/y
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y
Source of data	Monthly Break up of net export units report
Description of measurement methods and procedures to be applied	**Metering at 33 kV/220 kV level:** The electricity generated by the project activity WTG/s is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTG/s along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These tri vector energy meters are having accuracy class of 0.2s. The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import. The electricity (export and import) for the connected WTG/s is apportioned on monthly basis by the State Utility at 33 kV/220 kV

level on the basis of generation ratio at the applicable metering point (ratio of controller reading of connected WTG to the controller reading for all WTGs connected to the applicable metering point) and the electricity (export, import etc.) recorded by the energy meters at 33 kV/220 kV GSS on monthly basis. It will give export kWh & import kWh for connected WTG. The net export obtained at 33 kV/220 kV level for any given month for the connected WTG is then obtained by:

Net Export = Export kWh – Import kWh

All these metering points are further connected to the common delivery point at the 220 kV level.

Metering at 220 kV level:

The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) receiving from all connected metering points. The common metering point consist of both main & check meters. These energy meters are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility.

Billing of the energy will be done based on the energy break up available at the metering at 220 kV level.

Transmission loss:

The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of exports for all metering points at 33/220 kV level and the total reading of exports for same metering points recorded at the 220 kV level. Similarly, transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point (ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point)

The values of transmission loss during export & import for the given WTG are subtracting from EG Export, metering point & EG Import, metering point respectively to get the values of export and import respectively for the given month.

Net electricity delivered to the Grid:

The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export.

	The values of the net electricity delivered to the Grid are aggregated annually to get $EG_{BL,y.}$ The value of net electricity delivered to the Grid ($EG_{BL,y}$) by the project activity per annum is converted to MWh before the calculation of emission reductions (ex ante determined in tCO2/MWh unit).
Frequency of monitoring/recording	Continuous Monitoring and Monthly Recording
Value applied	14,374
Monitoring equipment	Electricity Meters. The meter details and meter calibration details have been described in Appendix I of Joint PD & MR.
QA/QC procedures to be applied	The meters are approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The calibration of the meters will be carried out by State Utility. The calibration of the meters will be carried out at least once in three years (as per paragraph 17 (c) of General Guidelines to SSC CDM methodologies, Version 17). In the absence of the meter calibration— Guidelines For Assessing Compliance With The Calibration Frequency Requirements will be applied appropriately to confirm the conservativeness of metering and emission reductions.
Purpose of data	To calculate baseline emission.
Calculation method	Net Export is calculated as the following formula Net Export = Export kWh – Import kWh
Comments	Data will be archived in electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

5.3 Monitoring Plan

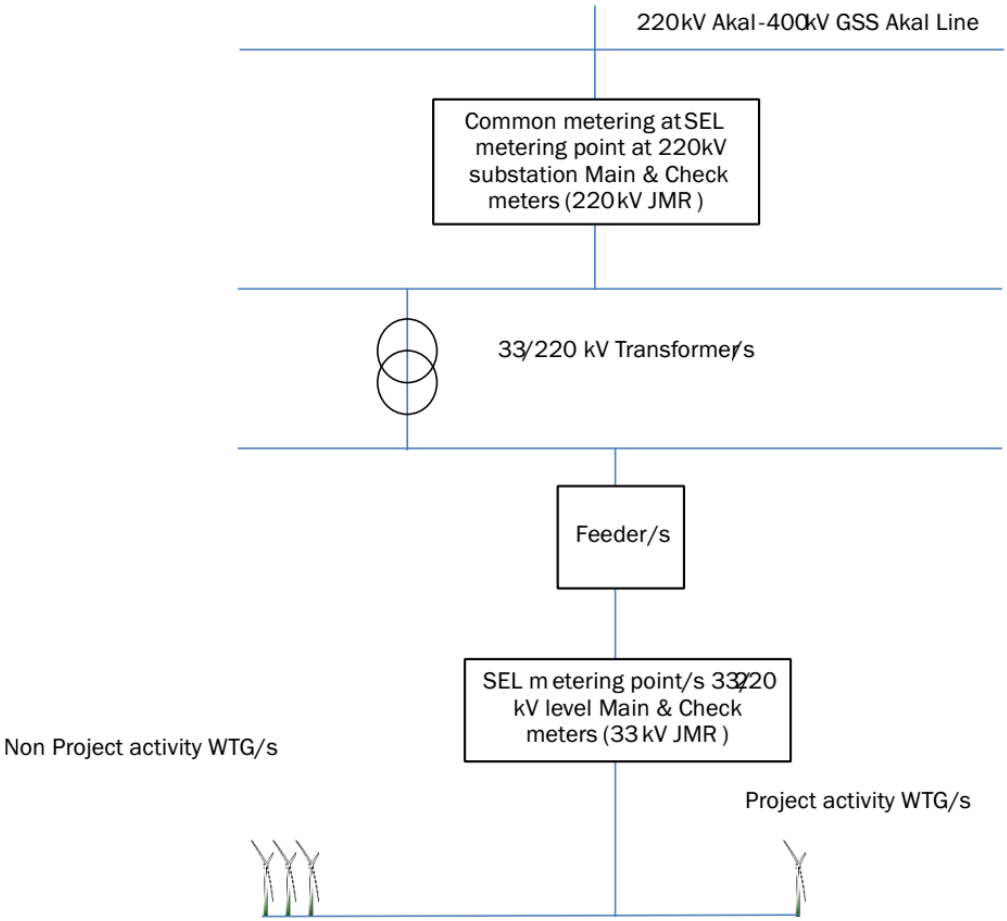
Monitoring of the project activity:

The monitoring of the project activity is given as below:

- The electricity generated by the project activity WTGs is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTGs along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These tri vector energy meters are having accuracy class of 0.2s.
- The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import.
- All these metering points are further connected to the common delivery point at the 220 kV level.

- The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) received from all connected metering points. The common metering point consist of both main & check meters. These energy meters are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility.
- Billing of the energy will be done based on the energy break up available at the metering at 220 kV level.
- The monitoring & measurement of electricity will be done on continuous basis; while recording will be done on monthly basis as Joint Meter Reading by the representatives of State Utility & PP.
- The value of monthly export by the project activity along with import and net export will be recorded in the monthly Break up of net export units report.
- The values of monthly export & import by the project activity recorded in the monthly Break up of net export units report is calculated based on the apportioning method by the state utility.
- The meters shall be approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The calibration of the meters will be carried out by State Utility.
- The calibration of the meters will be carried out at least once in three years (as per paragraph 17 (c) of General Guidelines to SSC CDM methodologies, Version 17). In the absence of the meter calibration— Guidelines for Assessing Compliance with the Calibration Frequency Requirements will be applied appropriately to confirm the conservativeness of metering and emission reductions.
- The net electricity supplied to the grid will be converted to MWh for calculation of emission reductions.
- Data is archived in electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.
- The PP is responsible for data collection & archiving.

The metering location diagram of the project activity is shown below:



Sample Apportioning Procedure:

The apportioning of the electricity is the responsibility of the State Utility. The sample apportioning procedure adopted for any given WTG for any given month is given below:

Generation Ratio at metering point (33 kV/220 kV level GSS):

The generation ratio is the ratio of electricity generated by installed WTG of PP to the total generation by all the connected WTGs to the applicable metering point.

$$G_{R,\ metering\ point} = EG_{Controller,\ WTG} / EG_{Controller,\ metering\ point} \quad (a)$$

Where:

$G_{R,\ metering\ point}$: Generation Ratio at metering point

$EG_{Controller,\ WTG}$: Electricity generated by installed WTG of PP connected to the applicable metering point.

$EG_{Controller, metering\ point}$: Total generation by all the connected WTGs to the applicable metering point.

Calculation of net electricity exported at applicable metering point:

The Main and Check meters at the applicable metering point measures number of parameters including export and import for all the connected WTGs.

The import, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Import, metering\ point} = G_{R, metering\ point} \times EG_{Total\ Import, metering\ point} \quad (b)$$

Where:

$EG_{Import, metering\ point}$: Import, kWh by the WTG at the metering point

$G_{R, metering\ point}$: Generation Ratio at metering point

$EG_{Total\ Import, metering\ point}$: Total Import, kWh by all the WTGs at the metering point

The export, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Export, metering\ point} = G_{R, metering\ point} \times EG_{Total\ Export, metering\ point} \quad (c)$$

$EG_{Export, metering\ point}$: Export, kWh by the WTG at the metering point

$G_{R, metering\ point}$: Generation Ratio at metering point

$EG_{Total\ Export, metering\ point}$: Total Export, kWh by all the WTGs at the metering point

The net electricity exported by the WTG at the 33 kV/220 kV level metering point is calculated by subtracting equation (b) from (c).

Thus, the net electricity exported at 33 kV/220 kV level metering point

$$= EG_{Export, metering\ point} - EG_{Import, metering\ point} \quad (d)$$

Transmission Loss Calculation:

The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of export for all metering points at 33/220 kV level and the total reading of export for same metering points recorded at the 220 kV level. Similarly transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point.

Generation Ratio at common delivery point:

It is the ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point.

$$G_{R, Common\ Delivery\ Point} = EG_{Controller, WTG} / EG_{Controller, Common\ Delivery\ Point} \quad (e)$$

Where,

$GR_{Common\ Delivery\ Point}$: Generation Ratio at common delivery point

$EG_{Controller,\ WTG}$: Electricity generated by installed WTG

$EG_{Controller,\ Common\ Delivery\ Point}$: Total generation by all the connected WTGs/ or connected metering points under common delivery point

Calculation of net electricity delivered to the Grid:

The values of transmission loss during export & import for the given WTG are subtracting from $EG_{Export,\ metering\ point}$ & $EG_{Import,\ metering\ point}$ respectively to get the values of export and import respectively for the given month.

The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export. Thus,

$$= \quad \text{Export} - \text{Import} \qquad (f)$$

These apportioned values viz import, export and net export kWh can be referred from the Monthly Break up of net export units report.

Operation & Maintenance of the Project:

Suzlon Infrastructure Services Ltd. is providing O & M services to the project promoter. Following services are provided by Suzlon Infrastructure Services Ltd.:

Routine Maintenance Services:

Routine maintenance labour work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and upkeep of the equipment including –

- Tower torquing
- Blade cleaning
- Nacelle torquing and cleaning
- Transformer oil filtration
- Control panel & LT panel maintenance
- Site and transformer yard maintenance

Security Services:

This service includes watch and ward and security of the wind turbines and the equipment.

Management Services:

- Data logging for power generation, grid availability, machine availability.
- Preparation and submission of monthly performance report in agreed format.
- Taking monthly meter reading jointly with utility of power generated at promoter's wind turbines and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

- Visual inspection of the WTGs and all parts thereof.
- Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services

Operational & Management Structure:

Sr. No.	Monitoring Team	Responsibility
1	Project Head	• Overall project management • Project execution • Review of project operations • Review of generation & achieved emission reductions by project • Liaisoning with Consultant/Suzlon
2	Project Coordinator	• Data Archival (electronic) • Site visit for actual project monitoring Storage of data • Coordination with O & M Contractor for day to-day operations • Coordination with Suzlon for regular calibration of meters • Reporting to Project Head • Online project monitoring • Feedback and corrective action wherever necessary
3	O & M Contractor (Suzlon)	• Compliance as per O & M Agreement with the PP.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,facility,y}$
Data unit	MWh/y
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y
Value applied:	

Year	MWh
2020	1,454.56

	2021(up to 20-March 2021)	930.80
	2021(from 21-March-2021 to 31-August-2021)	7,981.46
	Total	**10,366.817**
Comments	Data will be archived in electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.	

6.2 Baseline Emissions

Baseline Emissions (BE_y):

Baseline Emission in 2020 from 01-September-2020 to 31-December-2020,

$BE_y = EG_{PJ,facility,y} \times EF_{grid,CM,y}$

= 1,454.56MWh * 0.9487 tCO_2e/MWh
= 1,379 tCO_2e(Rounded Down Value)

Baseline Emission in 2021 from 01-January-2021 to 20-March-2021,

$BE_y = EG_{PJ,facility,y} \times EF_{grid,CM,y}$

= 930.80 MWh * 0.9487 tCO_2e/MWh
= 883 tCO_2e(Rounded Down Value)

Baseline Emission in 2021 from 21-March-2021 to 31-August-2021,

$BE_y = EG_{PJ,facility,y} \times EF_{grid,CM,y}$

= 7,981.46 MWh * 0.9346[15] tCO_2e/MWh
= 7,459 tCO_2e(Rounded Down Value)

6.3 Project Emissions

The project activity is based on renewable wind energy; therefore, project emissions should not be considered as per methodology, $PE_y = 0$

6.4 Leakage

No other leakage emissions are considered. $LE_y = 0$

6.5 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

[15] From 21-March-2021, second crediting period of the project activity started so the Combined Margin Emission Factor of second crediting period 0.9346tCO_2/MWh has been applied.

$ER_y = BE_y - PE_y - LE_y$

Where

ER_y = Emission reductions in year y (t CO_2e)

BE_y = Baseline emissions in year y (t CO_2e)

PE_y = Project emissions in year y (t CO_2e)

LEy = Leakage emissions in year y (t CO_2e)

The net GHG emission reduction for this project activity for current monitoring period is shown table below:

Table: Net Emission Reduction from 01-September-2020 to 20-March-2021 (Monitoring Period under First Crediting Period)

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2020	1,379	0	0	1,379
2021	883	0	0	883
Total	**2,262**	**0**	**0**	**2,262**

Table: Net Emission Reduction from 21-March-2021 to 31-August-2021 (Monitoring Period under Second Crediting Period)

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2021	7,459	0	0	7,459
Total	**7,459**	**0**	**0**	**7,459**

The total emission reduction for current monitoring period (01-September-2020 to 31-August-2021) is = (2,262 + 7,459) tCO_2e

= 9,721 tCO_2e.

The total monitoring period (01-September-2020 to 31-August-2021) is of 365 days within which first 201 days are under First Crediting Period and next 164 days are under Second Crediting Period. The estimated annual emission reduction as per PD is 13,636 $tCO_2$for first crediting period. The estimated annual emission reduction as per PD is 13,433 tCO_2 for second crediting period.

So, the estimated emission reduction for the first 201 days of monitoring period which are under First Crediting Period will be

= (13,636/365) ×201

= 7,509 tCO_2e

The estimated emission reduction for the next 164 days of monitoring period which are under Second Crediting Period will be

= (13,433/365) × 164

= 6,036 tCO_2e

So, the estimated emission reduction in current monitoring period

=(7,509 + 6,036) tCO_2e

=13,545 tCO_2e

The % fall in emission reduction in current monitoring period as compared to estimated emission reduction is = (13,545 – 9,721)/13,545

= 0.2823

= 28.23%

The fall (28.23%) in generation as compared to estimated emission reduction is justified as the generation in wind power plant is dependent on weather conditions
The Total Net emission reduction summary for total monitoring period is as below

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01-September-2020 to 31-December-2020	1,379	0	0	1,379
01-January-2021 to 31-August-2021	8,342	0	0	8,342
Total	**9,721**	**0**	**0**	**9,721**

APPENDIX I: METER CALIBRATION DETAILS

Location	Meter No.	Type	Make	Accuracy	Calibration Date	Validity of Calibration
SEL 81	RJB90208	Main Meter	Secure	0.2	20-April-2018, 17-June-2019	19-April-2021, 16-June-2022
SEL 81	RJB90209	Back Up Meter	Secure	0.2	20-April-2018, 17-June-2019	19-April-2021, 16-June-2022
SEL 204	RJB85056	Main Meter	Secure	0.2	12-June-2019	11-June-2022
SEL 204	RJB85057	Back Up Meter	Secure	0.2	12-June-2019	11-June-2022

APPENDIX II: MAJOR BREAKDOWN DETAILS

WTG ID	Date	Breakdown Hours
AK331	01-September-2021	12.7
AK331	01-October-2020	14.9
AK283	22-March-2021	14.9
AK278	26-March-2021	10.3
AK278	19-May-2021	11.6
AK283	19-May-2021	11.6
AK321	19-May-2021	11.6
AK331	19-May-2021	11.6
AK262	20-May-2021	13.8
AK278	20-May-2021	13.8
AK283	20-May-2021	10.2
AK283	20-May-2021	13.8
AK321	20-May-2021	13.8
AK331	20-May-2021	13.8
AK283	21-May-2021	13.2